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| (54) Title: METHOD FOR REQUESTING AND TRANSFERRING INFORMATION IN A DIGITAL AUDIO BROADCASTING SYSTEM | | |
| (57) Abstract <p>The above-mentioned objects are achieved in accordance with the invention by a method for transferring information from an information provider (100) to an information consumer (190) in a highly efficient manner by means of a digital audio broadcasting (DAB, 140) system and a secondary bidirectional transfer network (130). The secondary network provides information of where the DAB receiver (191) of the information consumer is located so that only suitable DAB transmitters (146) in the area are used for the information transfer itself. The location is determined by having at least one transmitter identification information (TII) of one transmitter that the receiver can receive transferred via the secondary network. Thereby only the necessary DAB transmitters need to be used for the information transfer, thus relieving the rest of the DAB transmitters (145, 147) from an unnecessary downloading.</p> | | |

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METHOD FOR REQUESTING AND TRANSFERRING INFORMATION IN A DIGITAL AUDIO BROADCASTING SYSTEM

FIELD OF THE INVENTION

5 The present invention relates generally to a method of information transfer, for example an electronic map, multimedia applications or the like, with one or more radiofrequency receivers such as mobile, portable, and stationary radiofrequency receivers, especially to a single
10 predetermined digital audio broadcasting (DAB) receiver.

BACKGROUND TO THE INVENTION

There exists a number of different methods of transferring information from an information/content provider to an information consumer, i.e. to the destination where the
15 information/content is intended to be used. In order to transfer information to an information consumer there must be some means for localizing the information consumer, which in some circumstances can be a problem. If the information consumer is stationary then the problem might
20 arise the first time an information transfer is to take place. On the other hand if the information consumer is mobile, then, depending on the method of transfer, the information consumer might have to be localized anew for each information transfer that is to take place. Another
25 problem is how to transfer the information in an effective manner, both from an economic as well as from a time point of view, the information is perhaps no good tomorrow and it must be affordable to get it.

A mobile telephone system is an information transfer system. Voice information in the form of digital information and also possibly pure digital data. A mobile telephone system addresses the previously mentioned
5 problems in a manner intended to be efficient mainly for speech. A mobile telephone system, GSM (Global System for Mobile communication) for example, is a two-way communications system that uses cells in which transfer of information between the mobile telephone and a base station
10 occur. As long as a mobile telephone is powered up (and even when on-hook) an intermittent exchange of information between the mobile phone and the base station of a cell in question takes place. The information exchange that takes place when the mobile phone is on-hook is, among other things, used for keeping track of the mobile phone. The
15 base station in question passes this information on to a central database that the mobile telephone operator maintains to keep track of where all the mobile telephones are located, i.e. in what cell they are for the moment. When a request to establish contact with the mobile phone
20 is made then an inquiry to the central database is made to find out in which cell the mobile phone is located so that the call can be directed to the appropriate base station for a subsequent correct radio communication setup.

25 A DAB (Digital Audio Broadcast) broadcasting system can have a similar cell structure as a mobile telephone system has, but DAB is a one-way broadcasting system, i.e. there is no way a DAB receiver can communicate with a DAB transmitter within the DAB system. The local DAB
30 transmitter does not know which DAB receivers are tuned in or can receive the transmitter or if any DAB receiver at all can or is receiving for that matter. Transfer of information to a DAB receiver would therefore involve transmitting this information across all cells that the DAB

receiver might be located in, which usually means the whole DAB network and possibly over all different frequencies.

5 A DAB receiver can determine its own location by using the unique TII (Transmitter Identification Information) that each DAB transmitter adds to the DAB frames. This means that a DAB receiver can distinguish locally valid information from information concerning other transmitter regions. This seems to be an improvement in the DAB system, especially in SFNs (Single Frequency Networks) and is described in US 5 493 709. US 5 493 709 describes how local information is transmitted in the complete DAB network to thereby be selectively filtered in the DAB receivers. This method will relieve a listener/user of information which does not concern the area in which the DAB receiver is located at the moment. Unfortunately it could be argued that the described method does not use the DAB broadcasting system in a very effective manner since system bandwidth in the whole system is used for information transfer of information which only has any value in a very limited area.

20 There seems to be no manner in which to transfer information in a DAB system to a predetermined single DAB receiver without having to download the whole system with the information, and especially not how to transfer this information in a secure manner.

SUMMARY OF THE INVENTION

25 An object of the invention is to define a method for providing an efficient manner of transferring information via a digital audio broadcasting system to one or more predetermined information consumers.

Another object of the invention is to define a method which is able to transfer information in a digital audio broadcasting system in a safe, error tolerant and efficient manner without downloading more than necessary of the digital audio broadcasting system.

The above-mentioned objects are achieved in accordance with the invention by a method for transferring information from an information provider to an information consumer in a highly efficient manner by means of a digital audio broadcasting (DAB) system and a secondary bidirectional transfer network. The secondary network provides information of where the DAB receiver of the information consumer is located so that only suitable DAB transmitters in the area are used for the information transfer itself. The location is determined by having at least one transmitter identification information (TII) of one transmitter that the receiver can receive transferred via the secondary network. Thereby only the necessary DAB transmitters needs to be used for the information transfer, thus relieving the rest of the DAB transmitters from an unnecessary downloading.

The aforementioned objects are also achieved according to the invention by a method for transferring information from an information provider to a predetermined information consumer. The information is transferred by means of a digital audio broadcasting system to a digital audio broadcasting receiver of the predetermined information consumer. To enable an efficient information transfer when a demand to transfer information to the predetermined information consumer is originated by the information provider the information transfer is supported by a secondary bidirectional transfer network such as NMT (Nordic Mobile Telephone), GSM (Global System for Mobile telephones), PSTN (Public Switched Telephone Network),

Internet, or the like. The method comprises a number of steps. First the information provider establishes contact with an information transfer point for requesting transfer of information to the predetermined information consumer.

5 The information transfer point can be part of the information provider, part of the DAB system, or a separate service. Thereafter the information transfer point retrieves access information of the predetermined information consumer based on the request from the

10 information provider. As a third step the information transfer point establishes an initial contact with the predetermined information consumer based on the retrieved access information about the predetermined information consumer. Thereafter the predetermined information

15 consumer provides the information transfer point, via the secondary bidirectional transfer network, with transfer configuration information comprising at least one transmitter identification information of a digital audio broadcasting transmitter that the digital audio

20 broadcasting receiver of the predetermined information consumer can receive. Finally the information provider via the information transfer point, based on the transfer configuration information, transfers information over the digital audio broadcasting system to the digital audio

25 broadcasting receiver of the predetermined information consumer to thereby transfer information from the information provider to the predetermined information consumer in an efficient way.

The method advantageously also, based on the transfer

30 configuration information, has the information transfer point transfer the information to the digital audio broadcasting receiver of the predetermined information consumer over a selected transmitter or transmitters in the digital audio broadcasting system.

The access information of the predetermined information consumer preferably provides information of how contact can be made with the predetermined information consumer via the secondary bidirectional transfer network and that the step of establishing an initial contact with the predetermined information consumer is done via the secondary bidirectional transfer network based on the access information of the predetermined information consumer. If the step of establishing initial contact with the predetermined information consumer via the secondary bidirectional transfer network cannot be concluded then preferably a broadcast over the digital audio broadcasting system is performed to alert the predetermined information consumer to establish contact with the information transfer point. If the information transfer point after a timeout has not been able to establish contact with the predetermined information consumer then preferably the information provider is notified that the predetermined information consumer cannot be positively contacted.

The access information of the predetermined information consumer can alternatively advantageously either provide no information on how contact can be made with the predetermined information consumer via the secondary bidirectional transfer network or provide information of how the predetermined information consumer is to be contacted by means of broadcasting over the digital audio broadcasting system to thereby alert the predetermined information consumer to establish contact with the information transfer point and that the step of establishing an initial contact with the predetermined information consumer is done via a broadcast over the digital audio broadcasting system to thereby alert the predetermined information consumer to establish contact with the information transfer point. If the information transfer point after a timeout has not been able to

establish contact with the predetermined information consumer then preferably the information provider is notified that the predetermined information consumer cannot be positively contacted.

5 The transfer configuration information can further advantageously also comprise at least one of either the transmitter identification information of all transmitters receivable by the digital audio broadcasting receiver of the predetermined information consumer, the field strengths
10 of all receivable transmitters, what program if any the digital audio broadcasting transmitter of the predetermined information consumer is currently receiving, or alternative information transfer routes. The information transfer point based on the transfer configuration information can
15 in some embodiments of the invention determine when and with what channel the information transfer is to take place and by means of the secondary bidirectional transfer network notify the predetermined information consumer of when and with what channel the information transfer is to
20 take place.

In some versions of the invention increased security of the information that is to be transferred is of increased concern and these comprise further steps. In a first additional step the information transfer point transfers a
25 crypto key to the predetermined information consumer by means of the secondary bidirectional transfer network before, during or after transferring information over the digital audio broadcasting system. The information to be transferred is encoded either by the information provider
30 or by the information transfer point. Decoding the transferred information is performed by means of the transferred crypto key either in the digital audio broadcasting receiver of the predetermined information consumer or by the predetermined information consumer.

When a high reliability of the transfer of the information is necessary the method according to the invention further comprises the following steps. First transferring checksums or the like, of the information that has or will be transferred via the digital audio broadcasting system, via the secondary bidirectional transfer network to the predetermined information consumer. Secondly checking the transferred information if it is uncorrupted based on the transferred checksums or the like. Checking is performed in the digital audio broadcasting receiver of the predetermined information consumer or by the predetermined information consumer. Thirdly the digital audio broadcasting receiver of the predetermined information consumer or the predetermined information consumer requesting, via the secondary bidirectional transfer network, to the information transfer point a resending of corrupted transferred information.

The aforementioned objects are also achieved by a method for transferring information from an information provider to an information consumer by means of a digital audio broadcasting system to a digital audio broadcasting receiver of the information consumer. The transfer is executed with support of a secondary bidirectional transfer network to thereby enable an efficient information transfer when a demand to transfer information to the information consumer is originated by the information consumer. The method comprises a number of steps. First of all the information consumer establishes an initial contact with an information transfer point via the secondary bidirectional transfer network with a request for an information transfer from the information provider to the information consumer. The information transfer point can be part of the information provider, part of the DAB system, or a separate service. Then the information consumer provides the information transfer point, via the secondary bidirectional

transfer network, with transfer configuration information comprising at least one transmitter identification information of a digital audio broadcasting transmitter that the digital audio broadcasting receiver of the information consumer can receive. The information transfer point retrieves the requested information. Thereafter the information provider via the information transfer point, based on the transfer configuration information, transfers information over the digital audio broadcasting system to the digital audio broadcasting receiver of the information consumer to thereby transfer information from the information provider to the information consumer in an efficient way.

The method advantageously also, based on the transfer configuration information, has the information transfer point transfer the information to the digital audio broadcasting receiver of the information consumer over a selected transmitter or transmitters in the digital audio broadcasting system.

The transfer configuration information can further advantageously also comprise at least one of either the transmitter identification information of all transmitters receivable by the digital audio broadcasting receiver of the information consumer, the field strengths of all receivable transmitters, what program if any the digital audio broadcasting transmitter of the information consumer is currently receiving, or alternative information transfer routes. The information transfer point based on the transfer configuration information can in some embodiments of the invention determine when and with what channel the information transfer is to take place and by means of the secondary bidirectional transfer network notify the information consumer of when and with what channel the information transfer is to take place.

The information transfer point can preferably confirm the availability or non-availability of the requested information to the information consumer via the secondary bidirectional transfer network or via the digital audio broadcasting system.

In some versions of the invention increased security of the information that is to be transferred is of increased concern and these comprise further steps. In a first additional step the information transfer point transfers a crypto key to the information consumer by means of the secondary bidirectional transfer network before, during or after transferring information over the digital audio broadcasting system. The information to be transferred is encoded either by the information provider or by the information transfer point. Decoding the transferred information is performed by means of the transferred crypto key either in the digital audio broadcasting receiver of the information consumer or by the information consumer.

When a high reliability of the transfer of the information is necessary the method according to the invention further comprises the following steps. First transferring checksums or the like, of the information that has or will be transferred via the digital audio broadcasting system, via the secondary bidirectional transfer network to the information consumer. Secondly checking the transferred information if it is uncorrupted based on the transferred checksums or the like. Checking is performed in the digital audio broadcasting receiver of the information consumer or by the information consumer. Thirdly the digital audio broadcasting receiver of the information consumer or the information consumer requesting, via the secondary bidirectional transfer network, to the information transfer point a resending of corrupted transferred information.

By providing a method for transferring information from an information provider to an information consumer over only selected parts of a digital audio broadcasting system, a plurality of advantages over prior art systems are obtained. By providing information to an information transfer point of which DAB transmitters is and optionally which can be received then the information transfer can be directed accordingly without having to download the whole system. The information needed by the information transfer point is transferred to it by means of a secondary bidirectional transfer network which can be a readily available telephone network such as GSM. A high security is obtained by transferring crypto keys and the like directly to the information consumer by means of the secondary bidirectional transfer network which in that case preferably is a point to point transfer network. High reliability is obtained by using the secondary bidirectional transfer network as a back channel for requests for resending faulty blocks of data. By combining a cheap, since the whole system bandwidth is not used, high capacity broadcasting system and a lower capacity or more expensive secondary bidirectional transfer network an efficient manner of transferring information is obtained according to the invention. Another advantage of the invention is the ability to be able to identify an information consumer either by the DAB receiver identity, the identity of the secondary bidirectional transfer network transceiver, another identifier which is hardware independant, or an arbitrary combination of the above.

30 DESCRIPTION OF THE FIGURES

The invention will now be described in more detail for explanatory, and in no sense limiting, purposes, with reference to the following figures, in which

- Fig. 1 shows a block diagram of one embodiment of a system according to the invention,
- Fig. 2 shows a flow chart of a method according to the invention,
- 5 Fig. 3 shows a flow chart of another method according to the invention,
- Fig. 4 shows a flow chart of how a high security and error tolerance is accomplished according to one method of the invention.

10 DESCRIPTION OF PREFERRED EMBODIMENTS

In order to clarify the system according to the invention, some examples of its use will now be described in connection with Figures 1 to 4.

15 Figure 1 shows a block diagram of one embodiment of a system according to the invention. As indicated in the figure and below certain parts can form smaller or larger groups. The information that is to be transferred to an information consumer / terminal 190 can be found at an information / content provider 100. The other parts that

20 make up the system are an information transfer point / a service provider 110, an access information database 120, a digital audio broadcasting (DAB) network / a network provider 140 with associated cells 145, 146, 147, a secondary bidirectional transfer network / an interaction

25 network 130, an information consumer / terminal 190 with a DAB receiver 191 and a transceiver 192 for the secondary bidirectional transfer network 130 and optionally means 199 for handling encrypted transmission. The access information database 120 is used to identify the secondary

network 130 and access in that network to an information consumer. The invention is not dependent on the exact physical closeness of the different parts, logically the information consumer 190 is preferably apart from the other parts 100, 110, 120, 130, 140 of the system. For example the information transfer point 110 might be part of the information provider 100, or form part with the access information database 120 and the DAB network / system 140, or be a completely independent service. As mentioned there are many possibilities, but they do not affect the invention.

Basically the invention locates the information consumer 190 and directs the information only to the whereabouts of the information consumer 190. The invention utilizes a broadcasting system 140 for transfer of information to the information consumer 190. A broadcasting system is very effective in transferring information to many receivers. Sometimes a broadcasting system is referred to as a point to multi point transfer system. A customary manner to transfer information to a single recipient is to use a so called point to point transfer system. A common disadvantage with a point to point system is that it is very expensive per unit of transferred information. A very attractive advantage with using a DAB system for transfer of information is its extremely large bandwidth, i.e. it can transfer large amounts of data / information in a very short space of time. By locating a receiver / consumer of information 190 in a broadcasting system 145, 146, 147 the transfer of information can be directed to that locality 146, enabling simultaneous use of the network by spacially separated receivers making the transfer of information very cost effective. A DAB system can be of a SFN (Single Frequency Network) nature, be of a more traditional radio broadcasting nature with different frequency regions / cells 145, 146, 147 or a combination of both where there

can be a SFN covering a nation or large region and also several different DAB frequency regions within the same coverage area, each of which can be a small SFN system. It is possible to direct and send different information within a SFN as well as in the traditional cell structure. Sending different information in a SFN requires great care, but is possible. However, both methods require that the locality of the receiver to be known if transmission of information to a single information consumer 190 is to be possible at all.

According to the invention a secondary bidirectional network 130 is used to transfer the information of the locality of the information consumer to the information transfer point 110. One method of acquiring the locality itself of the information consumer would be to use a GPS (Global Positioning System) and send the information to the information transfer point 110 via the secondary network 130. However, it could be seen as a disadvantage at times to have to include a GPS with the information consumer.

Another method of locating the information consumer 190 would be to use the information that a cell based secondary bidirectional transfer network 130, such as GSM, generates. Unfortunately that information is usually the propriety of the operator to that network and thus unavailable to users outside of that network. The use of that method would then be specific to a specific secondary network 130 which could be considered a disadvantage at times.

According to the invention the specific transmitter identification information (TII) that each transmitter in a DAB network sends is used to locate the information consumer 190. At least one TII is acquired and transferred to the information transfer point 110 via the secondary network 130. One is enough to at least roughly locate the

information consumer 190 with its DAB receiver 191 and secondary network transceiver 192. Optionally more receivable TIIs are transferred and optionally together with their respective field strengths. This enables the information transfer point 110 to fairly exactly pinpoint the information consumer 190 and thereby determine the most efficient manner in which to transfer the information. Criteria that the information transfer point 110 can use could for example be direction of travel, free capacity in the different channels, the amount of information to transfer, what channels are receivable, urgency / priority of the request to transfer information, and so on.

Figure 2 shows a flow chart of a method according to the invention utilizing, for example, a system according to figure 1. The method according to figure 2 describes when a demand for transferring information to an information consumer arises from an information provider, i.e. a push system. In a first step, a demand step 210, a demand to transfer information to an information consumer originates at an information provider. This demand is transferred as a request to an information transfer point in a request step 220. The information transfer point executes a lookup in a lookup step 230 to establish the known methods of establishing contact with the information consumer. Based on the lookup in a establish contact step 240, contact with the information consumer is established. The step of establishing contact 240 can optionally involve the following substeps. Substep SBTN or DAB ? 241 establishes if the initial contact with the information consumer is to be done via the secondary bidirectional transfer network (SBTN) or via the digital audio broadcasting network (DAB). This information is usually available and established in the lookup step 230. If the secondary network is to be used then a substep contact ? 242 determines if it is possible to establish contact with the information

consumer. If it is possible to establish contact with the information consumer, then in substeps DAB on ? 243 and turn on 244 it is made sure that the DAB receiver of the information consumer is turned on whereafter the procedure continues with step minimum info 250. If no contact was possible to establish in substep contact ? 242 due to, for example, the fact that the secondary network transceiver of the information consumer is turned off or the information transfer point has no or erroneous information about the secondary network of the information consumer, then one method to continue is to go to substep DAB broadcast 245. In the substep DAB broadcast 245 a general call is made via part or the complete DAB network to alert the information consumer that a demand to transfer information has arisen. If the general call is received by the information consumer in a substep received broadcast 246 then the information consumer should turn on its secondary network transceiver and confirm to the information transfer point in a substep confirm 247 that it has received the call and continues with step minimum info 250. On the other hand if the information transfer point does not receive a confirmation or any other contact with the information consumer within a predetermined space of time then in a substep timeout 248 the information provider is notified that no contact was possible to reach with the information consumer. After initial contact has been made with the information consumer then in the step minimum info 250 the information consumer transfers to the information transfer point via the secondary network transfer configuration information comprising at least one transmitter identification information (TII) that the DAB receiver of the information consumer can receive. Optionally in a substep optional info 251 the information consumer also provides the information transfer point with additional transfer configuration information such as additional receivable TIIs, field strengths of received transmitters, optional

transfer routes etc. Also optionally in a substep select 252 the information transfer point determines / selects an optimal route / channel to send the information. Finally in a transfer step 260 the information is transferred from the information provider to the information consumer via the digital audio broadcasting network.

Figure 3 shows a flow chart of another method according to the invention utilizing, for example, a system according to figure 1. The method according to figure 3 describes when a demand for transferring information to an information consumer arises from the information consumer, i.e. a pull system. In a first step, a need step 210, a need for a transfer of information to the information consumer originates in the information consumer itself. In the optional substeps DAB on ? 311, turn on 312, SBTN on ? 313, and turn on 314 the information consumer makes sure that the necessary equipment is turned on. The information consumer then in the step minimum info 320 makes an initial contact with and also transfers to the information transfer point via the secondary network the request for information and transfer configuration information comprising at least one transmitter identification information (TII) that the DAB receiver of the information consumer can receive. Optionally in a substep optional info 321 the information consumer also provides the information transfer point with additional transfer configuration information such as additional receivable TIIs, field strengths of received transmitters, optional transfer routes etc. In a data step 330 the information transfer point retrieves the requested information from an information provider. Optionally in a substep confirmation 331 the information transfer point confirms to the information consumer if the requested information is available or not. Also optionally in a substep select 332 the information transfer point determines / selects an optimal route / channel to send the

information. Finally in a transfer step 360 the information is transferred from the information provider to the information consumer via the digital audio broadcasting network.

5 Figure 4 shows a flow chart of how a high security and error tolerance is accomplished according to one method of the invention which can be implemented in the methods of figure 2 and 3 as substeps to the transfer steps 260 and 360 respectively. In a first step key 461 a crypto key or the
10 like is transferred to the information consumer via the secondary network. In a second step transfer 462 encoded information is transferred to the information consumer via DAB. The information is decoded / decrypted and a test is made in a step OK ? 463 to determine if the information was
15 received intact. If it was received without any errors then in a step confirmation 466 the information consumer confirms, via the secondary network, the reception of the information to the information transfer point. On the other hand if there is an error in the received information
20 then the information consumer in a step demand resend 464 makes a demand, via the secondary network, to the information transfer point to resend the faulty information. The information is resent in a step resend 465 over the DAB network after which the procedure proceeds
25 with step OK ? 363.

The present invention can be put into apparatus-form either as pure hardware, as pure software or as a combination of hardware and software. If the method according to the invention is realised in the form of software, it can be
30 completely independent or it can be one part of a larger program. The software can suitably be located in a general purpose computer or in a dedicated computer.

As a summary, the invention can basically be described as a method which provide an efficient manner of transferring information to an information consumer within a DAB network using a secondary bidirectional transfer network.

- 5 The invention is not limited to the embodiments described above but may be varied within the scope of the appended patent claims.

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FIG 1

100 requester / information provider
 110 information transfer point
 5 120 database
 130 secondary bidirectional transfer network SBTN
 140 DAB - Network provider
 145 cell 1
 146 cell 2
 10 147 cell 3
 190 user
 191 DAB receiver
 192 SBTN transceiver
 199 crypto

15 FIG 2

210 demand - for transfer of info to info consumer
 IC
 220 request - to information transfer point ITP
 230 lookup - of secondary bidir transfer network SBTN
 20 240 establish contact - with info IC based on lookup
 241 SBTN or DAB ? - no SBTN given then DAB broadcast
 242 contact ? - with / via SBTN
 243 DAB on ?
 244 turn on - if not
 25 245 DAB broadcast
 246 received broadcast ?
 247 confirm - if received
 248 timeout - and notify demander
 250 minimum info - TII
 30 251 optional info - field strength, extra TII
 252 select - method / DAB channel of transfer
 260 transfer - info to information consumer

FIG 3

310 need - of the information consumer
311 DAB on ?
312 turn on - if not
5 313 SBTN on ?
314 turn on - if not
320 minimum info - TII and request for information
321 optional info - field strength, what program
330 data - is retrived int. or ext. to ITP
10 331 confirmation - to IC that data is available
332 select - method / DAB channel of transfer ...
360 transfer - info to IC

FIG 4

461 key - to crypto sent via SBTN to DAB / IC
15 462 transfer - encoded blocks via DAB
463 OK ?
464 demand resend - of blocks that were not OK
465 resend - blocks
466 confirmation - to ITP that all OK

CLAIMS

1. A method for transferring information from an
5 information provider to a predetermined information
consumer by means of a digital audio broadcasting system to
a digital audio broadcasting receiver of the predetermined
information consumer and by means of support of a secondary
bidirectional transfer network to thereby enable an
10 efficient information transfer when a demand to transfer
information to the predetermined information consumer is
originated by the information provider, **characterized in**
that the method comprises the following steps:
- the information provider establishing contact with an
15 information transfer point for requesting transfer of
information to the predetermined information consumer;
 - the information transfer point retrieving access
information of the predetermined information consumer
based on the request from the information provider;
 - 20 - the information transfer point establishing an initial
contact with the predetermined information consumer
based on the retrieved access information about the
predetermined information consumer;
 - the predetermined information consumer providing the
25 information transfer point, via the secondary
bidirectional transfer network, with transfer
configuration information comprising at least one
transmitter identification information of a digital
audio broadcasting transmitter that the digital audio
30 broadcasting receiver of the predetermined information
consumer can receive;
 - the information provider via the information transfer
point, based on the transfer configuration

information, transferring information over the digital audio broadcasting system to the digital audio broadcasting receiver of the predetermined information consumer to thereby transfer information from the information provider to the predetermined information consumer in an efficient way.

2. The method according to claim 1, characterized in that based on the transfer configuration information the information transfer point can transfer the information to the digital audio broadcasting receiver of the predetermined information consumer over a selected transmitter or transmitters in the digital audio broadcasting system.

3. The method according to claim 1 or 2, characterized in that the access information of the predetermined information consumer provides information of how contact can be made with the predetermined information consumer via the secondary bidirectional transfer network and that the step of establishing an initial contact with the predetermined information consumer is done via the secondary bidirectional transfer network based on the access information of the predetermined information consumer.

4. The method according to claim 3, characterized in that if the step of establishing initial contact with the predetermined information consumer via the secondary bidirectional transfer network cannot be concluded then a broadcast over the digital audio broadcasting system is performed to alert the predetermined information consumer to establish contact with the information transfer point.

5. The method according to claim 4, characterized in that if the information transfer point after a timeout has not

been able to establish contact with the predetermined information consumer then the information provider is notified that the predetermined information consumer cannot be positively contacted.

5 6. The method according to claim 1 or 2, **characterized in that** the access information of the predetermined information consumer either provides no information on how contact can be made with the predetermined information consumer via the secondary bidirectional transfer network
10 or the access information provides information of how the predetermined information consumer is to be contacted by means of broadcasting over the digital audio broadcasting system to thereby alert the predetermined information consumer to establish contact with the information transfer point and that the step of establishing an initial contact
15 with the predetermined information consumer is done via a broadcast over the digital audio broadcasting system to thereby alert the predetermined information consumer to establish contact with the information transfer point.

20 7. The method according to claim 6, **characterized in that** if the information transfer point after a timeout has not been able to establish contact with the predetermined information consumer then the information provider is notified that the predetermined information consumer cannot
25 be positively contacted.

8. The method according to any one of claims 1 to 7, **characterized in that** the transfer configuration information further also comprises at least one of either the transmitter identification information of all
30 transmitters receivable by the digital audio broadcasting receiver of the predetermined information consumer, the field strengths of all receivable transmitters, what program if any the digital audio broadcasting transmitter

of the predetermined information consumer is currently receiving, or alternative information transfer routes.

5 9. The method according to any one of claims 1 to 8, characterized in that the information transfer point based on the transfer configuration information determines when and with what channel the information transfer is to take place and by means of the secondary bidirectional transfer network notifies the predetermined information consumer of when and with what channel the information transfer is to
10 take place.

10. The method according to any one of claims 1 to 9, characterized in that the method further comprises the following steps:

- 15 - the information transfer point transferring a crypto key to the predetermined information consumer by means of the secondary bidirectional transfer network before, during or after transferring information over the digital audio broadcasting system;
- 20 - encoding the information to be transferred either by the information provider or by the information transfer point;
- 25 - decoding by means of the transferred crypto key the transferred information either in the digital audio broadcasting receiver of the predetermined information consumer or by the predetermined information consumer.

11. The method according to any one of claims 1 to 10, characterized in that the method further comprises the following steps:

- 30 - transferring checksums or the like, of the information that has or will be transferred via the digital audio broadcasting system, via the secondary bidirectional transfer network to the predetermined information consumer;

- checking the transferred information if it is uncorrupted based on the transferred checksums or the like, checking in the digital audio broadcasting receiver of the predetermined information consumer or by the predetermined information consumer;
- the digital audio broadcasting receiver of the predetermined information consumer or the predetermined information consumer requesting, via the secondary bidirectional transfer network, to the information transfer point a resending of corrupted transferred information.

12. A method for transferring information from an information provider to an information consumer by means of a digital audio broadcasting system to a digital audio broadcasting receiver of the information consumer and by means of support of a secondary bidirectional transfer network to thereby enable an efficient information transfer when a demand to transfer information to the information consumer is originated by the information consumer, characterized in that the method comprises the following steps:

- the information consumer establishing an initial contact with an information transfer point via the secondary bidirectional transfer network with a request for an information transfer from the information provider to the information consumer;
- the information consumer providing the information transfer point, via the secondary bidirectional transfer network, with transfer configuration information comprising at least one transmitter identification information of a digital audio broadcasting transmitter that the digital audio broadcasting receiver of the information consumer can receive;

- the information transfer point retrieving the requested information;
- the information provider via the information transfer point, based on the transfer configuration information, transferring information over the digital audio broadcasting system to the digital audio broadcasting receiver of the information consumer to thereby transfer information from the information provider to the information consumer in an efficient way.

13. The method according to claim 12, **characterized in that** based on the transfer configuration information the information transfer point can transfer the information to the digital audio broadcasting receiver of the information consumer over a selected transmitter or transmitters in the digital audio broadcasting system.

14. The method according to claim 12 or 13, **characterized in that** the transfer configuration information further also comprises at least one of either the transmitter identification information of all transmitters receivable by the digital audio broadcasting receiver of the information consumer, the field strengths of all receivable transmitters, what program if any the digital audio broadcasting transmitter of the information consumer is currently receiving, or alternative information transfer routes.

15. The method according to any one of claims 12 to 14, **characterized in that** the information transfer point based on the transfer configuration information determines when and with what channel the information transfer is to take place and by means of the secondary bidirectional transfer network notifies the information consumer of when and with what channel the information transfer is to take place.

16. The method according to any one of claims 12 to 15, characterized in that the information transfer point confirms the availability or non-availability of the requested information to the information consumer via the secondary bidirectional transfer network or via the digital audio broadcasting system.

17. The method according to any one of claims 12 to 16, characterized in that the method further comprises the following steps:

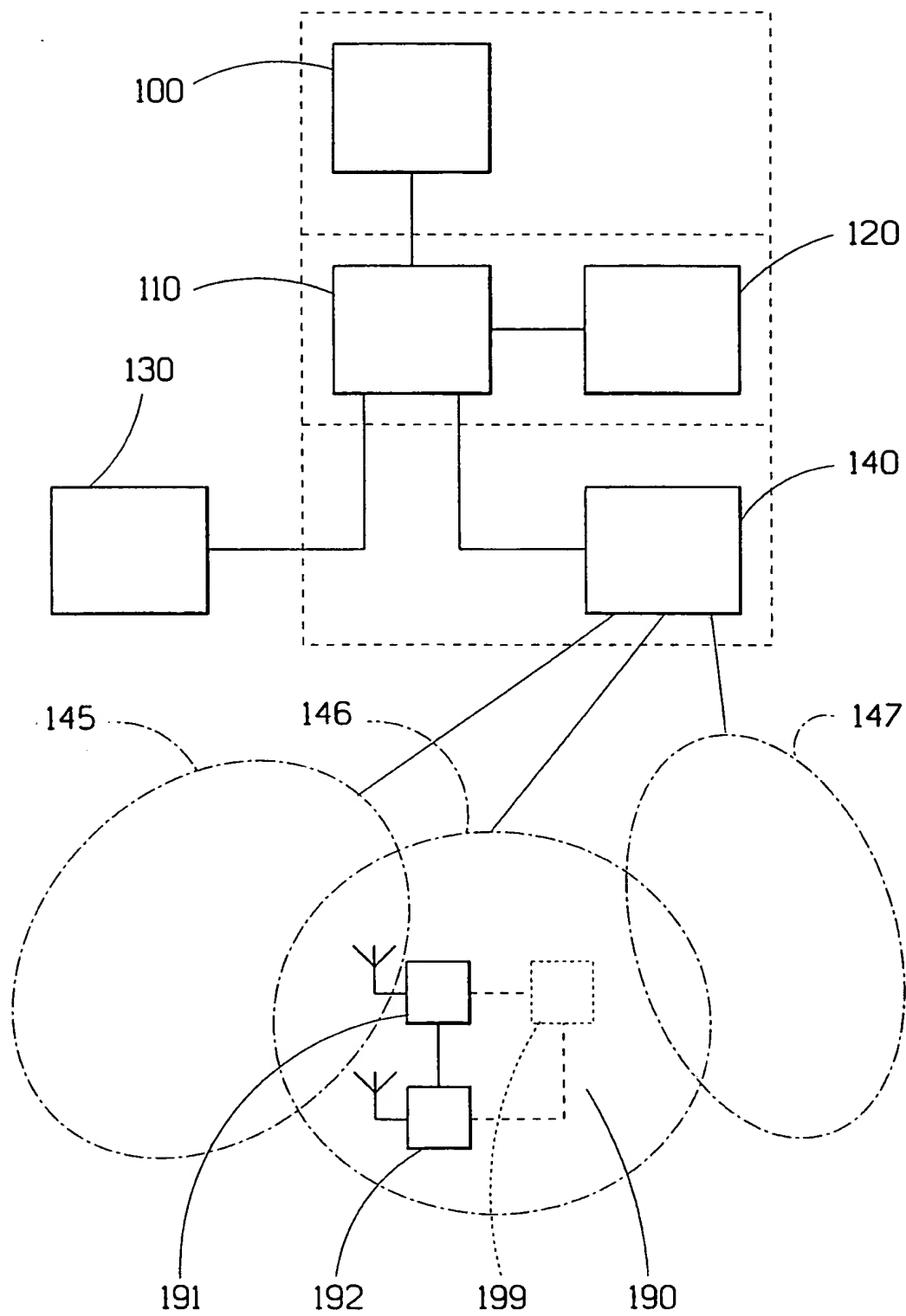
- 10 - the information transfer point transferring a crypto key to the information consumer by means of the secondary bidirectional transfer network before, during or after transferring information over the digital audio broadcasting system;
- 15 - encoding the information to be transferred either by the information provider or by the information transfer point;
- decoding by means of the transferred crypto key the transferred information either in the digital audio broadcasting receiver of the information consumer or
- 20 by the information consumer.

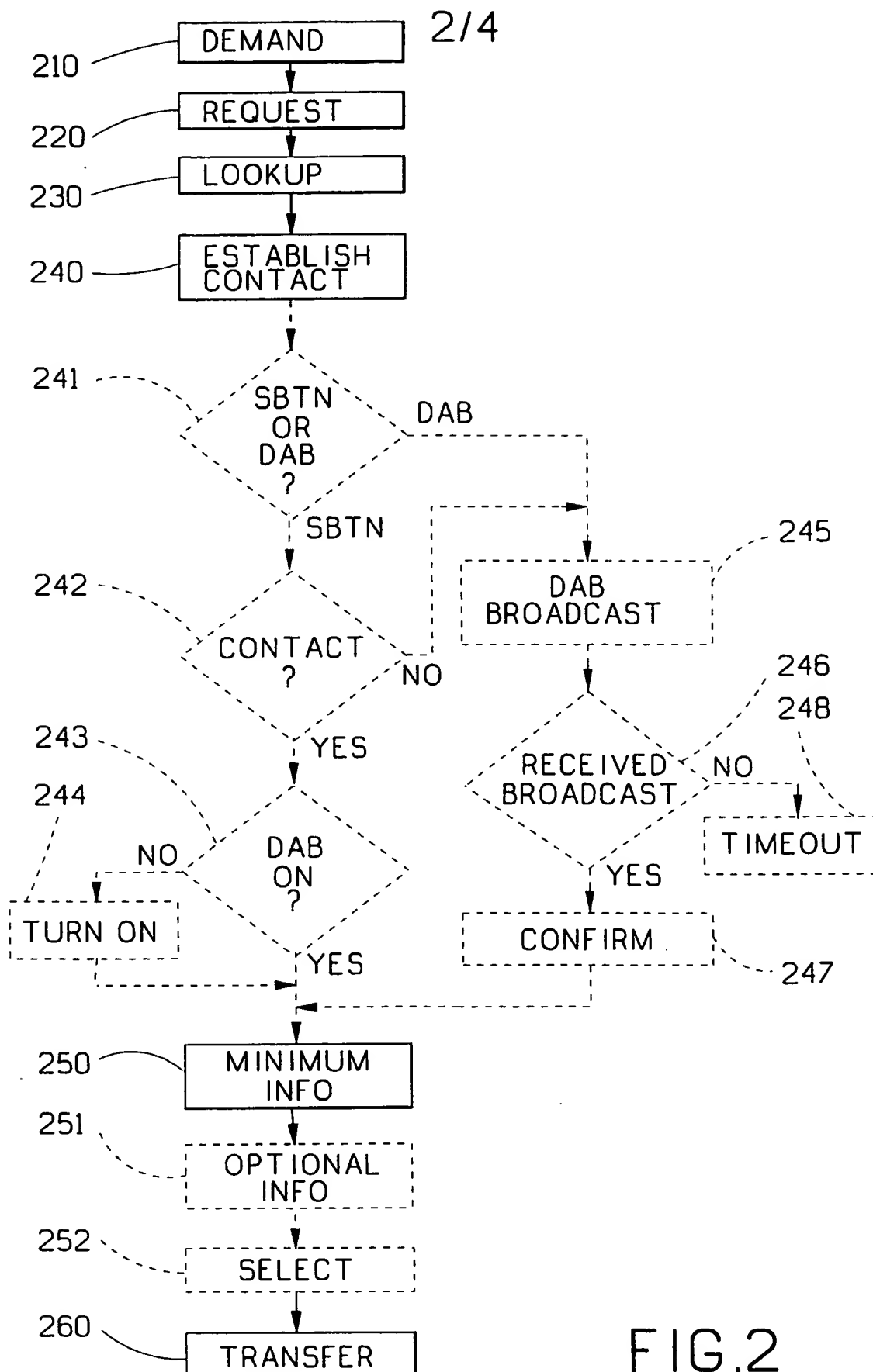
18. The method according to any one of claims 12 to 17, characterized in that the method further comprises the following steps:

- 25 - transferring checksums or the like, of the information that has or will be transferred via the digital audio broadcasting system, via the secondary bidirectional transfer network to the information consumer;
- checking the transferred information if it is uncorrupted, based on the transferred checksums or the like, checking in the digital audio broadcasting receiver of the information consumer or by the
- 30 information consumer;

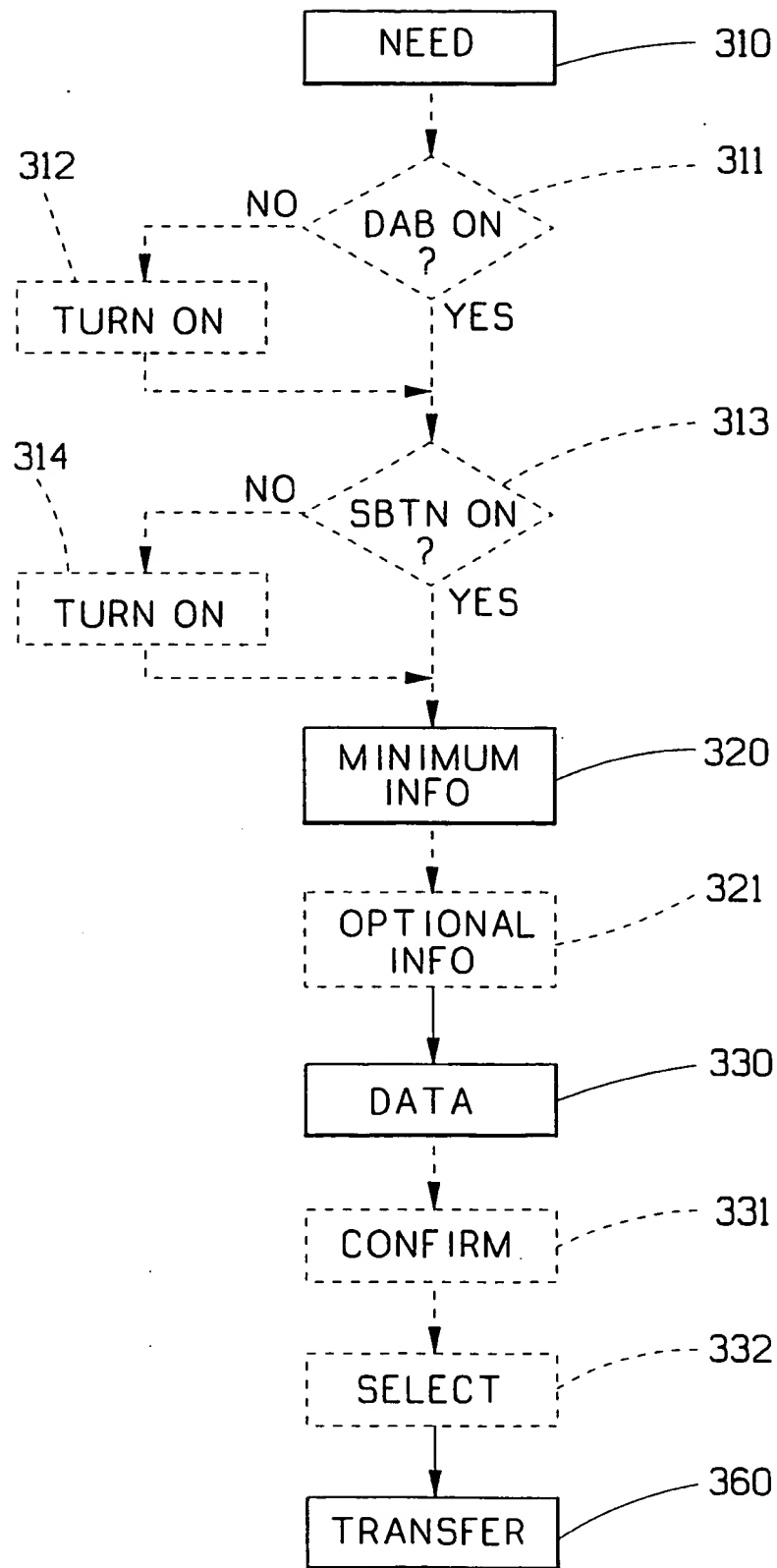
- the digital audio broadcasting receiver of the information consumer or the information consumer requesting, via the secondary bidirectional transfer network, to the information transfer point a resending of corrupted transferred information.
- 5

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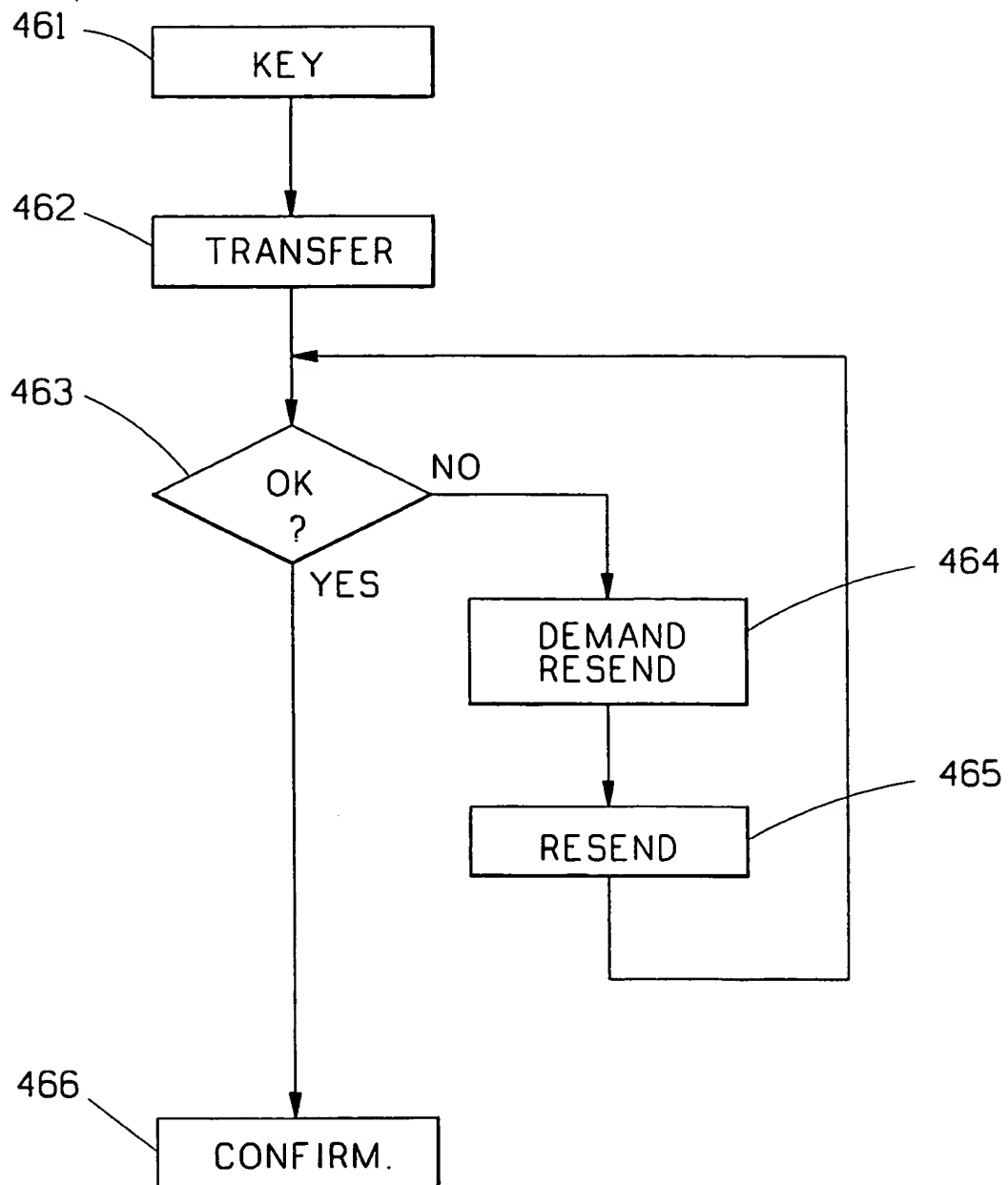
FIG.1



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FIG.3

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FIG.4

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 98/01625

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H01H 1/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H01H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|--|-----------------------|
| Y | IBM Technical Disclosure Bulletin, Volume 38, No 8, August 1995, ., "Personal Digital Radio Service" page 315 - page 316 | 1-9,12-16 |
| A | -- | 10,11,17,18 |
| A | US 5541980 A (LAWRENCE F. UREWICZ), 30 July 1996 (30.07.96), column 1, line 30 - line 40, abstract | 1,12 |
| A | -- | |
| A | US 5303393 A (GARY NOREEN ET AL), 12 April 1994 (12.04.94), abstract | 1,22 |
| | -- | |

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19 January 1999

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27 -01- 1999

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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|-----------|---|-----------------------|
| A | US 5493709 A (RALF DUCKECK ET AL), 20 February 1996 (20.02.96), column 2, line 13 - line 36, abstract -- | 1,12 |
| Y | WO 9712452 A1 (MOTOROLA INC.), 3 April 1997 (03.04.97), page 5, line 15 - page 6, line 9; page 6, line 30 - page 8, line 8; page 9, line 12 - line 27, abstract -- ----- | 1-9,12-16 |

INTERNATIONAL SEARCH REPORT

Information on patent family members

01/12/98

International application No.

PCT/SE 98/01625

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---------------------|----------------------------|---------------------|
| US 5541980 A | 30/07/96 | NONE | |
| US 5303393 A | 12/04/94 | US 5455823 A | 03/10/95 |
| US 5493709 A | 20/02/96 | CH 686329 A | 29/02/96 |
| | | DE 4233210 A,C | 07/04/94 |
| | | FR 2697957 A,B | 13/05/94 |
| WO 9712452 A1 | 03/04/97 | EP 0793878 A | 10/09/97 |
| | | JP 10510130 T | 29/09/98 |

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